SLOPE FAILURES AT EUBOEA MONTES, IO; P. Schenk, Lunar and Planetary Institute, Houston, TX 77058; and M. Bulmer, Center for Earth & Planetary Studies, NASM, Smithsonian Institution, Washington, DC 20560

Mass movement phenomena are important indicators of crustal stability and strength. The shape and morphology of deposits may also be related to the mobility of debris, and potentially the degree to which voltiles are entrained. One of the largest mass movements in the Solar System has been identified on Io on the north flank of Euboea Montes (-48°, 335°). Using stereo Voyager images we map the detailed morphology of this landslide deposit, and using a digital stereogrammetry procedure developed at LPI, we map the topography and dimensions of this deposit to study its properties and comparison this deposit other examples of mass movement on other planets.

Mountainous terrain covers only ~2% of the surface of Io [1], and is one important observation indicating that a material, probably silicate-rich, of significantly more strength than sulfur comprises much of Io's crust. Euboea Montes rises 11 km above the surrounding plains and is over 250 km long. There are two distinct morphological subcategories of mass movement at Euboea. The north flank of Euboea Montes consists of a smooth planar surface tilted ~6 degrees toward the northwest. At the base of this flank is a coarsely textured deposit 75x200 km across characterized by numerous subparallel grooves and ridges oriented parallel to the downslope direction. The distal edge of the deposit is characterized by multiple lobes at the toe. These and other morphologies, together with the complete lack of volcanic features, are indicative of gravitational mass movement of material. The emplacement mechanism of the debris masses has not yet been determined but may have been rapid. The smooth north flank of Euboea Montes is interpreted as a planar bedding contact along which the debris moved.

The well defined start of the ridges and grooves at the base of the mountain's north flank also correspond to a break in slope. Another break in slope within the debris appears to be related to a preexisting contact over which the debris flowed. This contact, defined by a scarp a few hundred meters high, may be a lava flow. The contact stops at the toe of the debris apron but a trace of it appears to continue under it, reappearing to the east. The ridges that characterize the debris apron disappear at the location of this contact, suggesting that flow behavior changed where the apron crossed this contact. The morphologic characteristics of this Ionian debris apron are similar to terrestrial rock avalanches on Earth [2], Mars [3,4], and the Moon [5].

Slope failure on the southwestern end of Euboe Montes is characterized by more massive deposits. Large blocks 30 x 100 km across have detached from the mountain

and moved a few km down slope. Some blocks may have disintigrated as they moved, forming lobate toes. The characteristics of these deposits are similar to those of translational and rotational failures and have analogs on the terrestrial planets [6].

The debris apron on the north flank of Euboea Montes travelled a maximum of 130 km down an average slope of 5-6 degrees. The travel distances and fall heights of the debris apron at Euboea Montes are the largest identified for mass movement on a planet to date. The thickness of the debris apron is 3 to 3.5 km at the toe. The volume of the debris apron is as much as 51600 km3, making it the largest in the solar system. Comparison with other debris aprons suggests that the mobility of this debris deposit was similar to that of many terrestrial debris aprons. The mobility of debris aprons may have important implications for the presence of volatiles in the crust of Io [e.g., 7].

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Figure 1. Comparison of the fall heights and run-out distances of debris aprons on planets and satellites.